first quarter and the three-legged Manx man in the second quarter; the motto belonging to this latter is *Quocunque jeceris stabit.*[1] The Duchess of Sutherland (Countess of Cromartie) bears this symbol in her arms for Macleod, in the first and third quarters.

The crest of the Earls of Seafield is a salamander in flames; the Marquis of Hertford has a phœnix in flames out of a ducal coronet; Mackenzie of Scatwell, co. Ross, has on the second quarter of his arms a rock in flames, and on the third quarter three legs of a man armed, for Macleod of Lewis; Lord Ongley, a phœnix in flames holding in its beak a fire-ball; Verney, Bt., a demi-phœnix in flames looking at the rays of the sun; and Carmichael, Bt., has in the second and third quarters of his arms, a cup with flames of fire issuing therefrom.

We will now turn to the third portion of our subject—the sun as a ring, or a simple circle—bearing in mind that the former type is in heraldry called *amulets* or *annulets*, and that the simple circle is styled a *bezant*.

The Earl of Lonsdale has in his coat-of-arms six annulets forming a triangle; the Earl of Bantry one annulet in the first, and ten bezants in the fourth quarter of his coat-of-arms; Barron, Bt., on a Saltier gu., five annulets. Amory Bagge, and Bailey, Bts., bear also annulets.

In the possession of a member of the writer's family is a seal of rock crystal, on which is the motto *Luceo non uro*;[2] beneath this is a baron's coronet (for the Barony of Strange, which came to the Dukes of Athole through the female line), and below this, again, the sun in glory. It is believed (but none are now living who know this for a fact) that this seal formerly belonged to Marjory, second wife of the fourth Duke of Athole, eldest daughter of James, sixteenth Lord Forbes, and widow of John Lord Macleod, who died s.p. in 1789; she married the Duke in 1794, and died in 1842, having had by him a son and a daughter who predeceased her.

The Isle of Man belonged at one time to the Macleods—when, is apparently not known—but in 1405-6 it came into the possession of the Stanleys (afterwards Earls of Derby), through Sir John Stanley, Kt., who in conjunction with Roger Leke received a commission to seize the city of York and its liberties, and also the Isle of Man upon its forfeiture by Henry Percy, Earl of Northumberland. The Stanleys held the Isle of Man until the death of Ferdinando, the fifth Earl, without male heirs, when the Barony of Strange—which title had been borne by the second Earl, who died in 1522—fell into abeyance between his daughters, and the earldom went to his brother William, sixth Earl, who bought from his nieces their claims on the Isle of Man. His son, again, the seventh Earl, was summoned to Parliament in 1627 as Baron Strange, under the impression that his father had enjoyed it; this was, however, not the case, and the summons was virtually a new peerage, which eventually devolved upon the ducal house of Athole, through the marriage of Amelia Anna Sophia, youngest daughter of the seventh Earl of Derby, by his wife Charlotte de la Trémoille, daughter of the Duc de Thours in France, with John, second Earl and first Marquis of Athole. Failing male heirs to her father, Charlotte, daughter of the second Duke of Athole, became Baroness Strange on his death in 1764, and also succeeded to his rights in the Isle of Man. She married her cousin, John Murray, who became the third Duke.

Another seal, also in the writer's family, has an impression which differs essentially from the armed legs of the Isle of Man. It is known to have been the private seal of the fourth Duke. The Manx emblem correctly described is "the three legs of a man armed ppr. conjoined in the centre at the upper part of the thighs, placed in triangle garnished and spurred *or*": but on this seal the three legs are bare, and conjoined in the centre by a sun with rays. In fact, it is the trinacria of Sicily.

HARRIET G. M. MURRAY-AYNSLEY.

Bishop's Ring.—The Sky-coloured Clouds.

DURING a recent visit to the Alps I carefully looked for Bishop's ring, and found that it was generally visible at high altitudes in the middle of the day when the sky was clear. On the whole, the higher one ascended, the plainer it was, up to a height of 9000 feet, beyond which I did not go. On one occasion it was visible nearly or quite as low down as Chamounix, altitude 3400 feet; but this was the lowest point I saw it from. It was always extremely faint, so much so that if I had not seen it previously in its greater brightness I should not have noticed it at all,—indeed, it could usually only be detected by a careful comparison of the colour of different parts of the sky. Its dimension seems the same as heretofore.

About sunrise and sunset this circle continues occasionally conspicuously visible here, but it is long since I saw it in the middle of the day, when the sky has been really clear; sometimes, however, I have seen a similar circle, but with much duller colours and extremely feeble, giving one the impression that it was lower in the atmosphere than Bishop's ring as caused by the volcanic dust, and that it might be caused by smoke.

Last evening, and still more this morning, there was a bright display of the "sky-coloured clouds" (if I may so call them). I seldom or never saw them more brilliant than they were this morning, when I observed a circumstance as regards their colour that I have not noticed before: the greater part of them was coloured as usual, the lower part a dull yellowish green, and the upper part a bright, though light, blue; but there was a border of yellow above the blue, very faintly lit up it is true, but unmistakable. The display was almost confined to that part of the horizon between north-north-east and north-north-west, the cloud-mass evidently not extending further east or west to any extent, and the upper border after 2 a.m., at least, was evidently the actual southern edge of the cloud sheet.

I had the opportunity of watching these clouds gradually fade away in the increasing daylight, showing that in all probability they did not evaporate, but simply became invisible owing to the increasing light of the sky, and perhaps also to their losing light themselves. It is again evident, therefore, that they are of an exceedingly filmy and transparent nature, and indeed can hardly be considered real clouds at all.

Their motion was very slow, but appeared on the whole much as usual—viz. from a north-easterly direction.

Sunderland, July 30. T. W. BACKHOUSE.

The Electricity of the Contact of Gases with Liquids.

SINCE the delivery of Helmholtz's famous Faraday Lecture, "the charge on the atom" has been assumed by physicists, notwithstanding the very serious objections urged by Maxwell against such a theory. A re-perusal of the latter, some eighteen months ago, excited me to make some experiments on the subject. It occurred to me that by allowing such solutions as potassic iodide and chlorine water to react in an insulated vessel some information might be obtained as to the equality or inequality of the atomic charges.

My object at present is not to give an account of the many experiments of this kind which I made, but briefly to call attention to one result to which they led, and I shall describe only such experiments as are necessary for this purpose.

One of the electrodes of a quadrant electrometer was "put to earth," the other was connected to an insulated stand on which was placed a porcelain dish containing a small quantity of distilled water. The instrument was in a rather sensitive state. A high-resistance Daniell, through which a current never passed, gave a deflection of 94 divisions either way. A small fragment of potassium was cast on the water. The spot went rapidly to the left, indicating a negative charge on the porcelain dish, and a positive charge on the escaping hydrogen. A second fragment of K was thrown on the liquid in the insulated dish. The spot moved 28 divisions to the left, then turned and went up the scale to the right 300 divisions. A third piece of K was thrown on the liquid in the insulated basin, and the spot moved 40 divisions to the right. This behaviour was extremely perplexing. The connexions were looked up, and the experiment repeated with like irregular results.

Na was used instead of K, and although the deflections then obtained were also irregular, the tabulated results showed a contrast. When Na was used, 40 per cent. of the deflections were *first* to the left; when potassium was used, 70 per cent. of the deflections were *first* to the left. Speaking broadly, this seemed to indicate that with K the hydrogen came off charged positively, with the sodium it came off charged negatively; and as I thought that such a result would throw some light on the atomic charges I tried very hard to eliminate what I then believed to be accidental exceptions, and to prove that in reality such was the case. But I tried in vain.

Retaining the same method of testing the electrification, other

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[1] Signifying, "However you throw me I stand." This is true of the svastika, a fire symbol likewise.

[2] "I give light, but I do not burn."

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combinations, such as H_2SO_4 and Na, H_2SO_4 + Zn, HNO_3 and K, &c., were tried, and in most cases irregular deflections such as those above described were obtained. Ultimately I got two constant and definite results: (1) Na thrown on strong and pure acetic acid invariably left a positive charge on the insulated dish, the escaping hydrogen being negative; (2) a fragment of zinc thrown into strong HCl invariably left a negative charge on the insulated dish, the escaping hydrogen being positive.

This last is a gross and unmistakable result. In fact its very magnitude was for some time a source of embarrassment. I shall not stop to describe the steps by which the next experiment was reached, but shall proceed at once to describe it; and I shall venture to give it somewhat in detail, as the title at the head of the paper is mainly founded on it.

The electrometer was not in a very sensitive state. The high-resistance Daniell aforesaid gave a deflection of 38 divisions on either side. A glass beaker 7½ inches high and 5 inches in diameter was placed on the insulated stand. A porcelain dish, 2¾ inches in diameter and 1⅛ inches high, was nearly filled with a 10 per cent. solution in distilled water of strong HCl, and placed at the bottom of the glass beaker just described. The insulated stand was now connected to one pair of quadrants, the other pair were put to earth. The "spot" stood at 378 on the scale. Three small fragments of granulated zinc were now dropped into the dilute HCl in the insulated dish. A very slight effervescence at once appeared. This gradually increased but never became violent. No trace of spray could be detected at the end of the experiment above the lower half of the beaker. In 4 minutes from dropping the zinc the spot could be perceived moving, and in 4½ minutes more it moved 28 divisions to the left, indicating the charge on the dish negative and the escaping hydrogen positive. The insulated stand, &c., was now disconnected from the quadrants. The spot maintained its position on the scale. In 1½ minute after, the quadrants were again connected to the insulated stand: the spot moved instantly 20 divisions more to the left. In 1½ minute more it had moved 10 divisions further to the left, but with a slower pace, and it presently stopped and turned back, at first slowly, taking 5 minutes to go back the 68 divisions to the zero. In 4 minutes more it had moved 80 divisions to the right. The insulated stand was once more disconnected from the quadrants, and at the end of 2 minutes they were re-connected, when the spot instantly bounded up 55 divisions further to the right. It continued to move in the same direction until the effervescence ceased owing to the acid being exhausted. A quantity of the zinc survived. On short-circuiting the quadrants the spot returned to within 4 divisions of the original zero.

As the reaction between zinc and hydrochloric acid proceeds, the quantity of chloride of zinc in solution continually increases, and so it appears demonstrated that when hydrogen passes through hydrochloric acid it acquires a positive charge, when it passes through chloride of zinc it acquires a negative charge. I believe that this inference may be safely very much generalized, but for the present I forbear. In confirmation of it, however, it may be well to mention that at any stage of the last experiment a deflection may be obtained to right or left as required by adding an excess of saturated chloride of zinc (for the first), or of hydrochloric acid (for the second).

When it is known that the sign of the charge on escaping hydrogen depends upon the substance it has been in contact with, the very irregular results with K and Na already mentioned become less mysterious.

J. ENRIGHT.

Newton's Laws of Motion.

THERE is a point in connection with Newton's laws of motion which the text-books on dynamics, which found the science upon those laws, seem to me to leave very inconveniently and unnecessarily mysterious. The point to which I allude is the meaning of the words "rest or uniform motion in a straight line" in the first law. The difficult words are "uniform" and "straight," which of course are each of them meaningless until it is explained what the motion is with reference to; but this explanation is not given explicitly in any of the books on dynamics which I am acquainted with; and a comparison of their various statements leaves me in some doubt as to what is intended to be implied. May I therefore appeal to those of your readers who accept Newton's laws to say whether the following is correct?

I find that Law III. is interpreted by the most influential authorities, such as Maxwell and Tait, to mean that force occurs only as one side of a mutual action, consisting of two equal and opposite forces between two portions of matter. I am therefore led to suppose that the freedom from force action, which is spoken of in Law I., should be explained (by means of Law III.) as meaning isolation from the influence of all other matter; and that Law I. must be considered as containing a definition of an arbitrary meaning to be given in dynamics to the words "rest or uniform motion in a straight line," namely, that it is the motion possessed by any particle isolated from the influence of all other matter, which influence is to be traced by its mutual character. Law I. would then go on to say, as an experimental result, that all isolated particles move with reference to one another in a way consistent with this definition.

In order to reach this conclusion I find it necessary to interpret some statements in text-books in a somewhat awkward fashion (*e.g.* Maxwell, "Matter and Motion," article xl.), and to suppose some others to be incorrect; hence my doubts, and my appeal for their resolution.

W.

August 9.

On the Constant P in Observations of Terrestrial Magnetism.

ON page 304 of vol. ii. of their excellent treatise on "Practical Physics," Messrs. Stewart and Gee give the usual expression for the constant depending upon the distribution of magnetism in a pair of magnets employed for measuring terrestrial horizontal force; namely—

$$P = \frac{A - A'}{\frac{A}{r^2} - \frac{A'}{r_1^{\,2}}}.$$

Instead of this awkward and troublesome form, I would suggest

$$P = \frac{r_1^{\,2} r^2}{r_1^{\,2} - r^2}\left(1 - \frac{A'}{A}\right),$$

which can be readily deduced from Gauss's original equations, and is much better adapted to logarithmic computation; especially when r and r_2 remain constant throughout a series of observations, and Gaussian logarithms are used to form the factor $(1 - A'/A)$.

WM. HARKNESS.

Washington, D.C., August 1.

The Stature of the Human Race.

IN your "Notes" of last issue, p. 348, you mention General Pitt-Rivers conducting a party of the Royal Archæological Institute to Woodcutts, where skeletons dug out show that the people who inhabited the ancient Romano-British village were of very inferior stature, the males being only on an average 5 feet 2 inches, and the females 4 feet 10 inches. I think it would be a very interesting inquiry to ascertain the average height of the human race in the past, as it appears to me from such data as I have been able to collect that the human race has continuously increased in average stature. I have measured a great many Roman coffins, where I happened to come across them, and my average shows that the Roman could not have greatly exceeded 5 feet 5 inches. In taking measurements of ancient armour, I find that the English aristocracy have decidedly increased in average height within 500 years. For a paper I read before our local Society, I measured twenty-five mummies in the British Museum as nearly as I could through the cases, making estimate for wrapping, and I found the average height of males 61 inches, females 55 inches. The mummy of the celebrated Cleopatra measures about 54 inches, about the height of the present average European girl of 13. The most ancient mummy of an Egyptian king yet discovered measured 52 inches. With research I have no doubt interesting data could be obtained on this subject. Limiting the matter to my own observations, I have formed the idea that the average stature of the human race increases at about the rate of 1·25 inches per 1000 years.

WM. F. STANLEY.

Cumberton, South Norwood, August 13.

A Spider allowing for the Force of Gravity.

THE manœuvres of the small hunting spider, so common on the West Coast of Africa, are always attractive, and my interest

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